

WHAT IS CLAIMED IS:

1. A semiconductor storage device comprising:

5 a first conductivity type semiconductor part (11, 111, 111a, 72, 189) composed of any one of a semiconductor substrate (11, 111, 111a), a well region provided in a semiconductor substrate and a semiconductor film (72, 189) disposed on an insulator (71, 188);

10 a gate insulating film (12, 114, 114a) formed on the first conductivity type semiconductor part;

a gate electrode (13, 117, 117a) formed on the gate insulating film;

charge holding portions (10A, 10B; 20A, 20B; 161, 162; 162a) formed on opposite sides of the gate electrode;

15 second conductivity type diffusion layer regions (17, 18; 57, 58; 112, 113; 113a) formed in regions of the first conductivity type semiconductor part corresponding to the respective charge holding portions; and

a channel region (31) below the gate electrode;

20 wherein

the charge holding portions (10A, 10B; 20A, 20B; 161, 162; 162a) are each constructed so as to change, in accordance with an electric charge amount held in the charge holding portions, a current amount flowing from one 25 of the second conductivity type diffusion layer regions to

the other of the diffusion layer regions through the channel region when a voltage is applied to the gate electrode (13, 117, 117a); and

part of each charge holding portion (10A, 10B; 5 20A, 20B; 161, 162; 162a) is present below an interface of the gate insulating film (12, 114, 114a) and the channel region (31).

2. The semiconductor storage device as defined in 10 Claim 1, wherein

a distance (D) between the interface of the gate insulating film and the channel region and a plane approximately parallel to the interface and containing a bottom of each charge holding portion is 2 nm to 15 nm.

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3. The semiconductor storage device as defined in Claim 1, wherein

the charge holding portions each include:

a first insulator (15, 22, 142, 142a, 142b) 20 having a function of holding electric charges; and a second insulator (14, 21, 141, 141a, 144) having a function of preventing dissipation of the electric charges held in the first insulator by separating the first insulator from the gate electrode, the channel region and 25 the corresponding diffusion layer region.

4. The semiconductor storage device as defined in
Claim 3, wherein

the first insulator is silicon nitride, and the
5 second insulator is silicon oxide.

5. The semiconductor storage device as defined in
Claim 1, wherein

the charge holding portions each include a first
10 insulator (15, 22, 142, 142a, 142b) having a function of
storing electric charges, and second and third insulators
(21, 23; 141, 143; 141a, 143a; 144) having a function of
preventing dissipation of the electric charges held in the
first insulator, and the first insulator is interposed
15 between the second insulator and the third insulator.

6. The semiconductor storage device as defined in
Claim 5, wherein

the first insulator is silicon nitride, and the
20 second and third insulators are silicon oxide.

7. The semiconductor storage device as defined in
Claim 5, wherein

the second insulator is provided in a manner so
25 as to separate the first insulator from the gate electrode,

the channel region and the corresponding diffusion layer region, and

a thickness (T1) of the second insulator on the channel region is smaller than a thickness (T2) of the gate insulating film, but 0.8 nm or more.

8. The semiconductor storage device as defined in Claim 5, wherein

the second insulator is formed in a manner so as to separate the first insulator from the gate electrode, the channel region and the diffusion layer region, and

a thickness (T1) of the second insulator on the channel region is larger than a thickness (T2) of the gate insulating film, but not more than 20 nm.

9. The semiconductor storage device as defined in Claim 5, wherein

the first insulator includes a portion opposed to a plane parallel to a top surface of the gate insulating film, with the second insulator disposed therebetween, the portion of the first insulator extending along the plane.

10. The semiconductor storage device as defined in Claim 9, wherein

the first insulator includes a portion opposed to a side surface of the gate electrode, with the second insulator disposed therebetween, the portion of the first insulator extending along the side surface.

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11. The semiconductor storage device as defined in Claim 1, wherein

the charge holding portions are arranged in a channel length direction such that at least part of each 10 charge holding portion is laid on the corresponding diffusion layer region.

12. The semiconductor storage device as defined in Claim 1, wherein

15 a distance (B) between the diffusion layer regions is set longer than a gate electrode length (A) in a channel length direction, and

the charge holding portions are arranged in the channel length direction such that only part of each charge 20 holding portion is laid on the corresponding diffusion layer region.